Permaculture

Permaculture is a set of design principles centered around whole systems thinking simulating or directly utilizing the patterns and resilient features observed in natural ecosystems. It uses these principles in a growing number of fields from regenerative agriculture, rewilding, community, and organizational design and development.

With its system of applied education, research and citizen-led design permaculture has grown a popular web of global networks and developed into a globalsocial movement.

The term permaculture was developed and coined by David Holmgren, then a graduate student at the Tasmanian College of Advanced Education's Department of Environmental Design, and Bill Mollison, senior lecturer in Environmental Psychology at University of Tasmania, in 1978. [1] The word *permaculture* originally referred to "permanent agriculture",[2][3] but was expanded to stand also for "permanent culture", as it was understood that social aspects were integral to a truly sustainable system as inspired by Masanobu Fukuoka's natural farming philosophy.

It has many branches that include, but are not limited to, ecological design, ecological engineering, regenerative design, environmental design, and construction. Permaculture also includes integrated water resources managementthat develops sustainable architecture, and regenerative and self-maintainedhabitat and agricultural systems modelled from natural ecosystems.[4][5]

Mollison has said: "Permaculture is a philosophy of working with, rather than against nature; of protracted and thoughtful observation rather than protracted and thoughtless labor; and of looking at plants and animals in all their functions, rather than treating any area as asingle product system."[6]

The 12 principles of permaculture most commonly referred to are first described by David Holmgren in his book *Permaculture: Principles and Pathways Beyond Sustainability* (2002). They include: Observe and Interact, Catch and Store Energy, Obtain a Yield, Apply Self Regulation and Accept Feedback, Use and Value Renewable Resources and Services, Produce No Waste, Design From Patterns to Details, Integrate Rather Than Segregate, Use Small and Slow Solutions, Use and Value Diversity, Use Edges and Value the Marginal, and Creatively Use and Respond toChange.

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History

Several individuals revolutionized the branch of permaculture. In 1929 Joseph Russell Smith added an antecedent term as the subtitle for *Tree Crops: A Permanent Agriculture*, a book which sums up his long experience experimenting with fruits and nuts as crops for human food and animal feed.[7] Smith saw the world as an inter-related whole and suggested mixed systems of trees and crops underneath. This book inspired many individuals intent on making agriculture more sustainable, such as Toyohiko Kagawa who pioneered forest farming in Japan in the 1930s.[8]

In Australian P.A. Yeomans' 1964 book *Water for Every Farm*, he supports the definition of permanent agriculture, as one that can be sustained indefinitely. Yeomans introduced both an observation-based approach to land use in Australia in the 1940s and the Keyline Design as a way of managing the supply and distribution of water in the 1950s.

Holmgren noted Stewart Brand's works as an early influence to permaculture.[9] Other early influences include Ruth Stout and Esther Deans, who pioneered no-dig gardening, and Masanobu Fukuoka who, in the late 1930s in Japan, began advocating no-till orchards and gardens and natural farming.[10]

In the late 1960s, Bill Mollison and David Holmgren started developing ideas about stable agricultural systems on the southern Australian island state of Tasmania. Dangers of the rapidly growing use of industrial-agricultural methods sparked these ideas.[11] In their view, these methods were highly dependent on non-renewable resources, and were additionally poisoning land and water, reducing biodiversity, and removing billions of tons of topsoil from previously fertile landscapes. They responded with a design approach called *permaculture*. This term was first made public with their publication of their 1978 book *Permaculture One*.[11]

Bill Mollison in 2008.

Among some of the more recognizable names who received their original training within Mollison's PDC system would include Geoff Lawton and Toby Hemenway, each of whom have more than 25 years experience teaching and promoting permaculture as a sustainable way of growing food. Simon J Fjell was a Founding Director of the Permaculture Institute in late 1979 and a teacher of the first Permaculture Design Course, having first met Mollison in 1976. He has since worked internationally and is currently listing a major social enterprise on NASDAQ.

By the early 1980s, the concept had broadened from agricultural systems design towards sustainable human habitats. After *Permaculture One*, Mollison further refined and developed the ideas by designing hundreds of permaculture sites and writing more detailed books, such as *Permaculture: A Designers Manual*. Mollison lectured in over 80 countries and taught his two-week Permaculture Design Course (PDC) to hundreds of students. Mollison "encouraged graduates to become teachers themselves and set up their own institutes and demonstration sites. This multiplier effect was critical to permaculture's rapid expansion."[12]

The permaculture movement also spread throughout Asia and Central America, with Hong Kong-based Asian Institute of Sustainable Architecture (AISA),[13] Rony Lec leading the foundation of the Mesoamerican Permaculture Institute (IMAP)[14] in Guatemala and Juan Rojas co-founding the Permaculture Institute of El Salvador.[15]

Core tenets and principles of design

The three core tenets of permaculture are:[16][17][18]

- **Care for the earth**: Provision for all life systems to continue and multiply. This is the first principle, because without a healthy earth, humans cannot flourish.
- **Care for the people**: Provision for people to access those resources necessary for their existence
- **Fair share**: By governing our own needs, we can set resources aside to further the above principles.[19] This includes returning waste back into the system to recycle into usefulness.[20] The third ethic is referred to as Fair Share, which reflects that each of us should take no more than what we need before we reinvest the surplus.

Permaculture design emphasizes patterns of landscape, function, and species assemblies. It determines where these elements should be placed so they can provide maximum benefit to the local environment. Permaculture maximizes useful connections between components and synergy of the final design. The focus of permaculture, therefore, is not on each separate element, but rather on the relationships created among elements by the way they are placed together; the whole becomes greater than the sum of its parts. Permaculture design therefore seeks to minimize waste, human labor, and energy input by building systems, and maximizes benefits between design elements to achieve a high level of synergy. Permaculture designs evolve over time by taking into account these relationships and elements and can evolve into extremely complex systems that produce a high density of food and materials with minimal input.[21]

The design principles, which are the conceptual foundation of permaculture, were derived from the science of systems ecology and study of pre-industrial examples of sustainable land use. Permaculture draws from several disciplines including organic farming, agroforestry, integrated farming, sustainable development, and applied ecology.[22] Permaculture has been applied most commonly to the design of housing and landscaping, integrating techniques such as agroforestry, natural building, and rainwater harvesting within the context of permaculture design principles and theory.

Theory

Twelve design principles

Twelve Permaculture design principles articulated by David Holmgren in his *Permaculture: Principles and Pathways Beyond Sustainability*:[23]

1. *Observe and interact*: By taking time to engage with nature we can design solutions that suit our particular situation.
2. *Catch and store energy*: By developing systems that collect resources at peak abundance, we can use them in times of need.
3. *Obtain a yield*: Ensure that you are getting truly useful rewards as part of the work that you are doing.
4. *Apply self-regulation and accept feedback*: We need to discourage inappropriate activity to ensure that systems can continue to function well.
5. *Use and value renewable resources and services*: Make the best use of nature's abundance to reduce our consumptive behavior and dependence on non-renewable resources.
6. *Produce no waste*: By valuing and making use of all the resources that are available to us, nothing goes to waste.
7. *Design from patterns to details*: By stepping back, we can observe patterns in nature and society. These can form the backbone of our designs, with the details filled in as we go.
8. *Integrate rather than segregate*: By putting the right things in the right place, relationships develop between those things and they work together to support each other
9. *Use small and slow solutions*: Small and slow systems are easier to maintain than big ones, making better use of local resources and producing more sustainable outcomes.
10. *Use and value diversity*: Diversity reduces vulnerability to a variety of threats and takes advantage of the unique nature of the environment in which it resides.
11. *Use edges and value the marginal*: The interface between things is where the most interesting events take place. These are often the most valuable, diverse and productive elements in the system.
12. *Creatively use and respond to change*: We can have a positive impact on inevitable change by carefully observing, and then intervening at the right time.

Layers

Layers are one of the tools used to design functional ecosystems that are both sustainable and of direct benefit to humans. A mature ecosystem has a huge number of relationships between its component parts: trees, understory, ground cover, soil, fungi, insects, and animals. Because plants grow to different heights, a diverse community of life is able to grow in a relatively small space, as the vegetation occupies different layers. There are generally seven recognized layers in a food forest, although some practitioners also include fungi as an eighth layer.[24]

Suburban permaculture garden in Sheffield, UK with different layers of vegetation

1. The canopy: the tallest trees in the system. Large trees dominate but typically do not saturate the area, i.e. there exist patches barren of trees.
2. Understory layer: trees that flourish in the dappled light under the canopy.
3. Shrub layer: a diverse layer of woody perennials of limited height. Includes most berry bushes.
4. Herbaceous layer: Plants in this layer die back to the ground every winter (if winters are cold enough, that is). They do not produce woody stems as the Shrub layer does. Many culinary and medicinal herbs are in this layer. A large variety of beneficial plants fall into this layer. May be annuals, biennials or perennials.
5. Soil surface/Groundcover: There is some overlap with the Herbaceous layer and the Groundcover layer, however plants in this layer grow much closer to the ground, grow densely to fill bare patches of soil, and often can tolerate some foot traffic. Cover crops retain soil and lessen erosion, along with green manures that add nutrients and organic matter to the soil, especially nitrogen.
6. Rhizosphere: Root layers within the soil. The major components of this layer are the soil and the organisms that live within it such as plant roots and rhizomes (including root crops such as potatoes and other edible tubers), fungi, insects, nematodes, worms, etc.
7. Vertical layer: climbers or vines, such as runner beans and lima beans (vine varieties).[24][25]

Guilds

A guild is a group of species where each provides a unique set of diverse functions that work in conjunction or harmony. There are many forms of guilds, including guilds of plants with similar functions that could interchange within an ecosystem, but the most common perception is that of a mutual support guild. Mutual support guilds are groups of plants, animals, insects, etc. that work well together. Plants may be grown for food production, draw nutrients from deep in the soil through tap roots, are nitrogen-fixing legumes, attract beneficial insects, and repel harmful insects. When grouped together in a mutually beneficial arrangement, these plants form a guild. See Dave Jacke's work on edible forest gardens for more information on other guilds, specifically resource-partitioning and community-function guilds.[26][27][28]

Edge effect

The edge effect in ecology is the effect of the juxtaposition, or placing contrasting environments on an ecosystem. Permaculturists argue that where vastly differing systems meet, there is an intense area of productivity and useful connections. An example of this is the coast; where the land and the sea meet, there is a particularly rich area that meets a disproportionate percentage of human and animal needs. This idea is played out in permacultural designs by using spirals in herb gardens, or creating ponds that have wavy undulating shorelines rather than a simple circle or oval (thereby increasing the amount of edge for a given area).[29]

Zones

Zones intelligently organize design elements in a human environment based on the frequency of human use and plant or animal needs. Frequently manipulated or harvested elements of the design are located close to the house in zones 1 and 2. Manipulated elements located further away are used less frequently. Zones are numbered from 0 to 5 based on positioning.[30]

Zone 0

The house, or home center. Here permaculture principles would be applied in terms of aiming to reduce energy and water needs, harnessing natural resources such as sunlight, and generally creating a harmonious, sustainable environment in which to live and work. Zone 0 is an informal designation, which is not specifically defined in Bill Mollison's book.

Zone 1

The zone nearest to the house, the location for those elements in the system that require frequent attention, or that need to be visited often, such as salad crops, herb plants, soft fruit like strawberries or raspberries, greenhouse and cold frames, propagation area, worm compost bin for kitchen waste, etc. Raised beds are often used in zone 1 in urban areas.

Permaculture zones 0-5

Zone 2

This area is used for siting perennial plants that require less frequent maintenance, such as occasional weed control or pruning, including currant bushes and orchards, pumpkins, sweet potato, etc. This would also be a good place for beehives, larger scale composting bins, etc.

Zone 3

The area where main-crops are grown, both for domestic use and for trade purposes. After establishment, care and maintenance required are fairly minimal (provided mulches and similar things are used), such as watering or weed control maybe once a week.

Zone 4

A semi-wild area. This zone is mainly used for forage and collecting wild food as well as production of timber for construction or firewood.

Zone 5

A wilderness area. There is no human intervention in zone 5 apart from the observation of natural ecosystems and cycles. Through this zone we build up a natural reserve of bacteria, moulds and insects that can aid the zones above it.[31]

People and permaculture

Permaculture uses observation of nature to create regenerative systems, and the place where this has been most visible has been on the landscape. There has been a growing awareness though that firstly, there is the need to pay more attention to the peoplecare ethic, as it is often the dynamics of people that can interfere with projects, and secondly that the principles of permaculture can be used as effectively to create vibrant, healthy and productive people and communities as they have been in landscapes.

Domesticated animals

Domesticated animals are often incorporated into site design, ensuring the efficiency and productivity of the system.[32] Animals, domestic or wild are a critical component of any wild or designed sustainable ecosystem. Research indicates that without the animal's participation and contribution, ecological integrity is diminished or impossible.[33] Some of the activities that contribute to the system include: foraging to cycle nutrients, clear fallen fruit, weed maintenance, spreading seeds, and pest maintenance. The nutrients are cycled by animals, transformed from their less digestible form (such as grass or twigs) into more nutrient-dense manure.[33]

Several animals can be incorporated into a permaculture system, including cows, goats, chickens, geese, turkey, rabbits, and worms. A more specific explanation of how the animals can be used is seen in the chicken design. Chickens can be used to scratch over the soil, thus breaking down the top soil and using the fecal matter as manure creating a sustainable system. However, in the domestication of these animals, the complexity and elegance lie in an effectiveness and efficiency of the design, including factors like timing and habits to specific areas of a farm. For example, animals require daily attention in a way that is much more demanding than plants.[34]

Common practices

Agroforestry

Agroforestry is an integrated approach of permaculture, which uses the interactive benefits from combining trees and shrubs with crops or livestock. It combines agricultural and forestry technologies to create more diverse, productive, profitable, healthy and sustainable land-use systems.[35] In agroforestry systems, trees or shrubs are intentionally used within agricultural systems, or non-timber forest products are cultured in forest settings.[36]

Forest gardening is a term permaculturalists use to describe systems designed to mimic natural forests. Forest gardens, like other permaculture designs, incorporate processes and relationships that the designers understand to be valuable in natural ecosystems. The terms forest garden and food forest are used interchangeably in the permaculture literature. Numerous permaculturists are proponents of forest gardens, such as Graham Bell, Patrick Whitefield, Dave Jacke, Eric Toensmeier and Geoff Lawton. Bell started building his forest garden in 1991 and wrote the book *The Permaculture Garden* in 1995, Whitefield wrote the book *How to Make a Forest Garden* in 2002, Jacke and Toensmeier co-authored the two volume book set *Edible Forest Gardening* in 2005, and Lawton presented the film *Establishing a Food Forest* in 2008.[21][37][38]

Tree Gardens, such as Kandyan tree gardens, in South and Southeast Asia, are often hundreds of years old. It is not self-evident whether these tree gardens derived initially from experiences of cultivation and forestry, as is the case in agroforestry or whether they derived from an understanding of forest ecosystems, as is the case for permaculture systems. Many studies of these systems, especially those that predate the term permaculture, consider these systems to be forms of agroforestry. Permaculturalists may obscure the distinction of permaculture and agroforestry when they include existing and ancient systems of polycropping as examples of food forests.

Food forests and agroforestry are parallel approaches that sometimes lead to similar designs.

Hügelkultur

Hügelkultur is the practice of burying large volumes of wood to increase soil water retention. The porous structure of wood acts as a sponge when decomposing underground. During the rainy season, masses of buried wood can absorb enough water to sustain crops through the dry season.[39] This technique has been used by permaculturalists Sepp Holzer, Toby Hemenway, Paul Wheaton, and Masanobu Fukuoka[40][41]

Natural building

A natural building involves a range of building systems and materials that place major emphasis on sustainability. Ways of achieving sustainability through natural building focus on durability and the use of minimally processed, plentiful or renewable resources, as well as those that, while recycled or salvaged, produce healthy living environments and maintain indoor air quality.

The basis of natural building is the need to lessen the environmental impact of buildings and other supporting systems, without sacrificing comfort, health, or aesthetics. Natural building primarily utilizes abundantly available natural materials (e.g., clay, rock, sand, straw, wood, reeds), and draws heavily on traditional architectural strategies from various climates across the world. In addition to relying on natural building materials, the emphasis on the architectural design is heightened. The orientation of a building, the utilization of local climate and site conditions, the emphasis on natural ventilation through design, fundamentally lessen operational costs and positively impact the environment. Building compactly and minimizing the ecological footprint is common, as are on-site handling of energy acquisition, on-site water capture, alternate sewage treatment, and water reuse. Most materials are sourced regionally, locally, or even on-site. Straw bales, and various earthen masonry techniques such as adobe bricks, cob (or monolithic adobe), rammed earth and clay-straw infill are common choices for wall material. Roofing coverings often used include sod or "living" roofs, thatch, and wooden shakes or shingles. Rubble trench foundations are popular, as they do not require concrete; likewise, dry-stacked or lime mortared stem walls are common. Natural builders also regularly combine different wall systems in a single building, making best use of different materials' thermal or water resistant properties, for example, where they are most needed in the structure.

Rainwater harvesting

Rainwater harvesting is the accumulating and storing of rainwater for reuse before it reaches the aquifer.[42] It has been used to provide drinking water, water for livestock, water for irrigation, as well as other typical uses. Rainwater collected from the roofs of houses and local institutions can make an important contribution to the availability of drinking water. It can supplement the subsoil water level and increase urban greenery. Water collected from the ground, sometimes from areas which are especially prepared for this purpose, is calledstormwater harvesting

Greywater is wastewater generated from domestic activities such as laundry, dishwashing, and bathing, which can be recycled on-site for uses such as landscape irrigation and constructed wetlands. Greywater is largely sterile, but not potable (drinkable). Greywater differs from water from the toilets, which is designated sewage or blackwater to indicate it contains human waste. Blackwater is septic or otherwise toxic and cannot easily be reused. There are, however, continuing efforts to make use of blackwater or human waste. The most notable is for composting through a process known as humanure; a combination of the words human and manure. Additionally, the methane in humanure can be collected and used similar to natural gas as a fuel, such as for heating or cooking, and is commonly referred to as biogas. Biogas can be harvested from the human waste and the remainder still used as humanure. Some of the simplest forms of humanure use include a composting toilet or an outhouse or dry bog surrounded by trees that are heavy feeders which can be coppiced for wood fuel. This process eliminates the use of a standard toilet with plumbing.

Sheet mulching

In agriculture and gardening, mulch is a protective cover placed over the soil. Any material or combination can be used as mulch, such as stones, leaves, cardboard, wood chips, gravel, etc., though in permaculture mulches of organic material are the most common because they perform more functions. These include absorbing rainfall, reducing evaporation, providing nutrients, increasing organic matter in the soil, feeding and creating habitat for soil organisms, suppressing weed growth and seed germination, moderating diurnal temperature swings, protecting against frost, and reducing erosion. Sheet mulching is an agricultural no-dig gardening technique that attempts to mimic natural processes occurring within forests. Sheet mulching mimics the leaf cover that is found on forest floors. When deployed properly and in combination with other Permacultural principles, it can generate healthy, productive and low maintenance ecosystems.[43][44]

Sheet mulch serves as a "nutrient bank," storing the nutrients contained in organic matter and slowly making these nutrients available to plants as the organic matter slowly and naturally breaks down. It also improves the soil by attracting and feeding earthworms, slaters and many other soil micro-organisms, as well as adding humus. Earthworms "till" the soil, and their worm castings are among the best fertilizers and soil conditioners. Sheet mulching can be used to reduce or eliminate non-desired plants by starving them of light, and can be more advantageous than using herbicide or other methods of control.[45]

Intensive rotational grazing

Grazing has long been blamed for much of the destruction we see in the environment. However, it has been shown that when grazing is modeled after nature, the opposite effect can be seen.[46][47] Also known as cell grazing, managed intensive rotational grazing (MIRG) is a system of grazing in which ruminant and non-ruminant herds or flocks are regularly and systematically moved to fresh pasture, range, or forest with the intent to maximize the quality and quantity of forage growth. This disturbance is then followed by a period of rest which allows new growth. MIRG can be used with cattle, sheep, goats, pigs, chickens, rabbits, geese, turkeys, ducks, and other animals depending on the natural ecological community that is being mimicked. Sepp Holzer and Joel Salatin have shown how the disturbance caused by the animals can be the spark needed to start ecological succession or prepare ground for planting. Allan Savory's holistic management technique has been likened to "a permaculture approach to rangeland management".[48][49] One variation on MIRG that is gaining rapid popularity is called eco-grazing. Often used to either control invasives or re-establish native species, in eco-grazing the primary purpose of the animals is to benefit the environment and the animals can be, but are not necessarily, used for meat, milk or fiber.[50][51][52][53][54][55][56]

Keyline design

Keyline design is a technique for maximizing the beneficial use of water resources of a piece of land developed in Australia by farmer and engineer P. A. Yeomans. The *Keyline* refers to a specific topographic feature linked to water flow which is used in designing the drainage system of the site.[57] The essential factor in this system, the Keyline, is a level or sloping line extending in both directions from a point or divides the two types of relationship, always in the same vertical interval, that a valley bears to its ridges.[58]

Fruit tree management

Some proponents of permaculture advocate no, or limited, pruning. One advocate of this approach is Sepp Holzer who used the method in connection with Hügelkultur berms. He has successfully grown several varieties of fruiting trees at altitudes (approximately 9,000 feet (2,700 m)) far above their normal altitude, temperature, and snow load ranges. He notes that the Hügelkultur berms kept or generated enough heat to allow the roots to survive during alpine winter conditions. The point of having unpruned branches, he notes, was that the longer (more naturally formed) branches bend over under the snow load until they touched the ground, thus forming a natural arch against snow loads that would break a shorter, pruned, branch.

Masanobu Fukuoka, as part of early experiments on his family farm in Japan, experimented with no-pruning methods, noting that he ended up killing many fruit trees by simply letting them go, which made them become convoluted and tangled, and thus unhealthy.[59][60] Then he realised this is the difference between natural-form fruit trees and the process of change of tree form that results from abandoning previously-pruned unnatural fruit trees.[59][61] He concluded that the trees should be raised all their lives without pruning, so they form healthy and efficient branch patterns that follow their natural inclination. This is part of his implementation of the Tao-philosophy of Wú wéi translated in part as no-action (against nature), and he described it as no unnecessary pruning, nature farming or "do-nothing" farming, of fruit trees, distinct from non-intervention or literal no-pruning. He ultimately achieved yields comparable to or exceeding standard/intensive practices of using pruning and chemical fertilisation.[59][61][62]

Permaculture Action

Permaculture helps generate plans that are easy and cheap when it comes to production. Permaculture allows creativity and innovation in farming. The action of permaculture looks and all becoming consciously involved in the process of producing and ensuring abundant food nearby, problem on malnutrition caused by the world hunger problem will inevitably lessen.[63] Permaculture principles in action are powerful forces to help right the environmental wrongs of the last two centuries.[64]

Trademark and copyright issues

There has been contention over who, if anyone, controls legal rights to the word *permaculture*: is it trademarked or copyrighted? If so, who holds the legal rights to the use of the word? For a long time Bill Mollison claimed to have copyrighted the word, and his books said on the copyright page, "The contents of this book and the word PERMACULTURE are copyright." These statements were largely accepted at face value within the permaculture community. However, copyright law does not protect names, ideas, concepts, systems, or methods of doing something; it only protects the expression or the description of an idea, not the idea itself. Eventually Mollison acknowledged that he was mistaken and that no copyright protection existed for the word *permaculture*.[65]

In 2000, Mollison's US based Permaculture Institute sought a service mark (a form of trademark) for the word *permaculture* when used in educational services such as conducting classes, seminars, or workshops.[66] The service mark would have allowed Mollison and his two Permaculture Institutes (one in the US and one in Australia) to set enforceable guidelines regarding how permaculture could be taught and who could teach it, particularly with relation to the PDC, despite the fact that he had instituted a system of certification of teachers to teach the PDC in 1993. The service mark failed and was abandoned in 2001. Also in 2001 Mollison applied for trademarks in Australia for the terms "Permaculture Design Course"[67] and "Permaculture Design".[67] These applications were both withdrawn in 2003. In 2009 he sought a trademark for "Permaculture: A Designers' Manual"[67] and "Introduction to Permaculture",[67] the names of two of his books. These applications were withdrawn in 2011. There has never been a trademark for the word *permaculture* in Australia.[67]

Criticisms

General criticisms

In 2011, Owen Hablutzel argued that "permaculture has yet to gain a large amount of specific mainstream scientific acceptance," and that "the sensitiveness to being perceived and accepted on scientific terms is motivated in part by a desire for permaculture to expand and become increasingly relevant."

In his books *Sustainable Freshwater Aquaculture* and *Farming in Ponds and Dams*, Nick Romanowski expresses the view that the presentation of aquaculture in Bill Mollison's books is unrealistic and misleading.[68]

Agroforestry

Greg Williams argues that forests cannot be more productive than farmland because the net productivity of forests declines as they mature due to ecological succession.[69] Proponents of permaculture respond that this is true only if one compares data between woodland forest and climax vegetation, but not when comparing farmland vegetation with woodland forest. For example, ecological succession generally results in a forest's productivity rising after its establishment only until it reaches the *woodland state* (67% tree cover), before declining until *full maturity*.[21]

See also

- Agrarianism
- Agroecology
- Agroforestry
- Aquaponics
- Biodynamics
- Bill Mollison
- Geoff Lawton
- Willie Smits
- Biointensive agriculture
- Biomimicry
- Climate-friendly gardening
- David Holmgren
- Ecoagriculture
- Food-feed system
- Forest gardening
- Holzer Permaculture
- Hügelkultur
- List of permaculture projects
- Microponics
- Paul Wheaton
- Permaforestry
- Regenerative agriculture
- Seed saving
- Sepp Holzer
- Zaï

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- The Permaculture Research Institute – Permaculture Forums, Courses, Information, News and Worldwide Reports.
- The Worldwide Permaculture Network – Database of permaculture people and projects worldwide.
- The Permaculture Association, UK.
- The 15 pamphlets based on the 1981 Permaculture Design Course given by Bill Mollison (co-founder of permaculture) all in 1 PDF file.
- Ethics and principles of permaculture (Holmgren's)
- Permaculture a Beginners Guide – a 'pictorial walkthrough'
- Permaculture – Sustainability and sustainable development
- Urban Permaculture Design – a city lot with over a hundred perennial edible varieties. Permaculture land acquisition discussion.
- A quarter acre suburban property in Eugene, Oregon – grass to garden, reclaim automobile space, elevated/edible landscape, rain water catchment, passive solar design, education
- The Permaculture Activist is a co-evolving quarterly produced by a dedicated handful of entirely part-time folks
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